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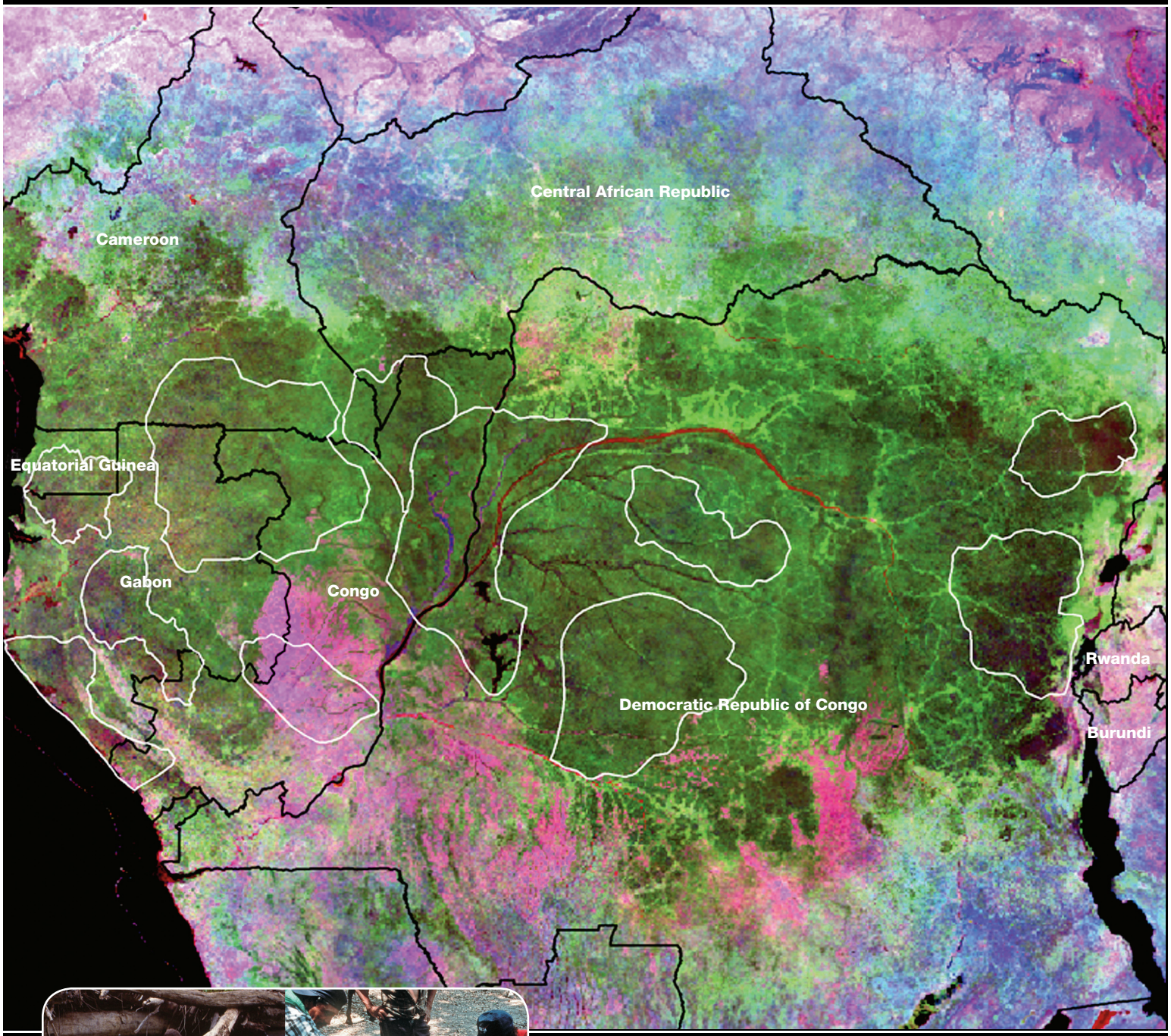
EYES ON ECOLOGICAL FORECASTING

Moderate Resolution Imaging Spectrometer (MODIS) satellite images from Terra collected between 1999 and 2002 were combined together to obtain this cloud free view of the Congo Basin. Images like these help scientists observe how land surface is changing over time from space. The image shows dense forests in dark green and degraded forest or agricultural areas in light green. Grassland appears in pink and wooded savannah in violet. The Congo Basin Forest Partnership (CBFP) conservation activities focus on the eleven landscapes (outlined in white). *(Image Credit: Matt Hansen, University of Maryland)*



Ecological forecasting involves the use of Earth observations and models to predict the impacts of environmental changes on the ecosystems upon which we depend for our very existence. It involves a grand interdisciplinary synthesis that links the fields of physics, geology, chemistry, biology, and societal practices. NASA is currently involved in several international and domestic partnerships under the theme of ecological forecasting. These partnerships are making important contributions to ongoing efforts to protect and sustain our ecosystems while at the same time protecting and sustaining the economies of these areas.

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Overview of the Program

At present, an array of Earth observing satellites are in orbit, and additional launches both by NASA and others will continue throughout the next decade. Our ability to observe our home planet from space has never been greater and will continue to grow. Increasingly, studies of the Earth focus on understanding the Earth's land, atmosphere, oceans, and life as a single integrated system rather than as individual independent elements. NASA is an important contributor in this systems approach to Earth science studies.

In addition to providing Earth observing capabilities, NASA forms strategic partnerships with other government, academic, private, and international organizations. Through these partnerships NASA's Earth science observations and measurements are linked to practical applications. NASA data, information, and predictive models help NASA's partners, and non-traditional users of Earth science, make timely and accurate decisions regarding management of resources and development of policy and maximize the impact of NASA science and technology to benefit society. The goal is ***to make Earth science data and information flow smoothly from satellite to society.***

Ecological Forecasting

Ecological forecasting involves the use of Earth observations and models to predict the impacts of environmental changes on the ecosystems upon which we depend for our very existence. It links the physical world of climate and geology to the living world of biology and ecology. Our goal is reliable forecast models of changes in living systems with uncertainties and estimates of error explicitly stated. These models must span spatial scales from molecular to global, as well as take advantage of information across time scales to test and refine the accuracy of our predictions. NASA is currently involved in several international and domestic partnerships under the theme of ecological forecasting.

Located at the junction of North and South America and characterized by significant changes in elevation, Central America is a biological crossroads with seven to eight percent of the planet's biodiversity in less than one half of one percent of its land mass. NASA is partnering with the U.S. Agency for International Development (USAID), the World Bank, and the Central American Commission for Environment and Development (CCAD) to develop a regional visualization and monitoring system known as SERVIR. SERVIR is a decision support tool that will assist the seven nations of Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama) in developing a Mesoamerican Biological Corridor extending from southern Mexico to the Colombian border. The leaders of these nations established the Corridor in 1997 in an unprecedented effort to integrate their conservation efforts across international boundaries and promote sustainable development throughout the region.

Using a geographic information system, SERVIR will combine satellite imagery with environmental and other data in a geographic information system and generate visualization products to aid decision makers with ecosystem management. These products will reach users through a series of information nodes located in each of the participating countries. Imagery from the Aqua, Terra, and Landsat 7 satellites will be used to detect wildfires and major changes in land cover. Terra and TRMM data will allow scientists to track rainfall and weather patterns, while Sea-viewing Wide Field of view Sensor (SeaWiFS) and Landsat 7 data will be used to monitor coastal margins and coral reefs throughout Central America.

NASA is also working with several U.S. agencies and governments in Central Africa and around the world to support the Congo Basin Forest Partnership (CBFP). The image on the front of this litho shows the 11 regions chosen as focus areas for the CBFP. These priority landscapes do not mean Protected Areas, but rather they represent zones within which conservation activities should play a prominent role. NASA Earth observing satellites provide important contributions to this effort. Moderate-resolution [Moderate Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua] and high-resolution [Enhanced Thematic Mapper Plus (ETM+) on Landsat 7 and Advanced Spaceborne Thermal Emittance and Reflection Radiometer (ASTER) on Terra] satellite data are being used to provide an overview of the state of the forest and highlight areas of change. The CBFP seeks to conserve some of the world's richest tropical ecosystems while meeting the needs of the people of Central Africa who depend on the resources found in these areas.

NASA also partners with nongovernmental organizations to examine the viability of national parks and other protected areas in this country and overseas. Part of this effort entails supplying Earth observation inputs to a decision support system that shows land managers, city planners, and developers how to minimize the impacts of development on natural ecosystems. With NASA support, NatureServe, a non-profit network connecting science with conservation, is implementing a decision support tool to help planners avoid those lands most important to biodiversity and other ecosystem services. An early prototype of this decision support system will focus on the Greater Yellowstone Ecosystem.

Ecological forecasting requires a grand scientific synthesis across the domains of physics, geology, chemistry, biology, and societal practices. NASA Earth observing satellites provide a unique viewpoint for collecting information on many of these domains. They give us an unprecedented capability to observe the Earth as an integrated system. The information returned from these satellites becomes invaluable input for ecological forecasting decision support tools as described above. Additional satellite launches are planned over the next decade that will increase both the quantity and the quality of input data available for these tools, which will increase the accuracy of their predictions. There will no doubt still be limits to what we can forecast, but discovering these limits and their causes will only enhance our overall understanding of the ecosystems we select to manage and preserve. The decision support systems partner organizations develop will be vital to efforts to build our economies while at the same time sustaining the natural ecosystems that provide us with the essential services we tend to take for granted, such as: clean air, fresh water, fertile soils, waste removal, and biodiversity.

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